GEOSPATIAL ENHANCEMENT FOR NIEM (GEO4NIEM)

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PM-ISE WIS3 "STANDARDS WAY AHEAD": (NIEM) PROMOTING NIEM & SDO COORDINATION in November

WIS3 ROADMAP

As an outcome of the Workshop on Information Sharing and Safeguarding Standards (WIS3) in December 2011, PM-ISE, in conjunction with industry and government standards organizations, created a roadmap to address:

- Standards coordination and governance
- National Information Exchange Model
- Standards development and interoperability
- Identity and access management
- Policy automation
- Geospatial
- Procurement and standards testing and certification

AN EMPHASIS ON GEOSPATIAL

Integrate NIEM and Geospatial activities:

- Standards Certification (OGC Testing/IJIS Springboard)
- Outreach
- Visualization Metadata
- Interoperability Pilots

Standards Way Ahead

Since the institution of the Office of the Program Manager for the Information Sharing Environment (PAI-ISE), the Office has worked with its mission partners — federal, state, local tribal, industry, and international— to develop guidelines. policies, standards, and architecture for responsible information sharing. The current vision for information sharing and

These that any person not the appropriate maximin need can discover and access actionable information as the right. time to successfully present have no the American people and protect national security. Descring must be done responsibly, secretarily, and securely with sefequents to protect privacy, and rights and shift liberties."

The call to action for GE partners is to accelerate delivery of the GE carpolities throughout the information lifesycle using schooling productivity gaves and reducing riph, Going forward, CE partiests must make informed investment decisions using alleged resources, harmonise policy, refunding business processes, integrate attendants activities, and

is an efform to strangically employ partners, the BNA-GE conducted the Workshop on Information Sharing and Suffigured in Districts (1953) in Districts (2013, to unite as a community to discuss the challenges and apportunities

The purpose of this document is to (1) put forward guiding objections for coordination of information sharing and infequency standards activities, and 2) promote a baseline set of recommendations and activities to develop a long-

- Mission-driver. SE capabilities and impossable must be no all mission partners' requirements and embance continued affective rise as a result of information and service sharing while better managing course. a pand removes. Never his important superior of efficiency, efficiencies, and aging, bandwise.
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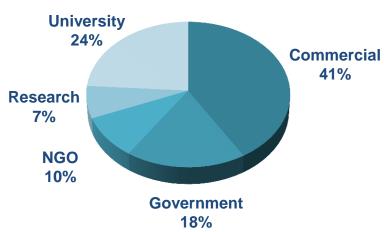
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OGC AT A GLANCE



A non-profit, international, voluntary consensus standards organization that is leading the development of standards for geospatial and location-based services.

- Founded in 1994
- 480+ members and growing
- 38 implementation standards
- Hundreds of product implementations in the market
- Broad user community implementation worldwide
- Alliances and collaborative activities with ISO and many other SDO's



OGC's Mission

To serve as a **global forum** for the collaboration of developers and users of spatial data products and services, and to advance the development of **open**, **international standards** for geospatial interoperability.

GEOSPATIAL ENHANCEMENT FOR NIEM (GEO4NIEM)



Develop and test recommendations for enhanced geospatial capabilities in NIEM

- Use of geospatial enhancements in NIEM Naming and Design Rules and Adapters
- Use of embedded GML in NIEM Information Exchange Packages (IEPs)
- Test and demonstrate recommended practices for embedded GML and Adapters
- Develop architecture documentation and "Fact Sheet" for use of embedded GML and Adapters



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GEO4NIEM PARTICIPANTS AND CONTRIBUTORS



PARTICIPANTS











CONTRIBUTORS





WHAT IS GML? (GEOGRAPHY MARKUP LANGUAGE)



- XML-based language for encoding geographic information to be stored and transported over the Internet
- Modeling language for geographic systems
- Open interchange format for geographic transactions on the Internet
- Defines both the geometry and properties of objects that comprise geographic information

WHY GML?

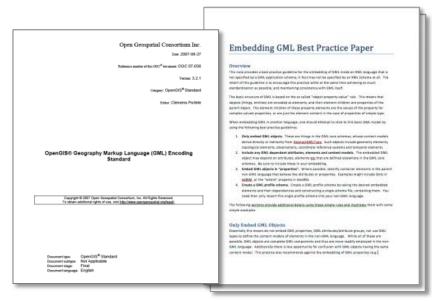


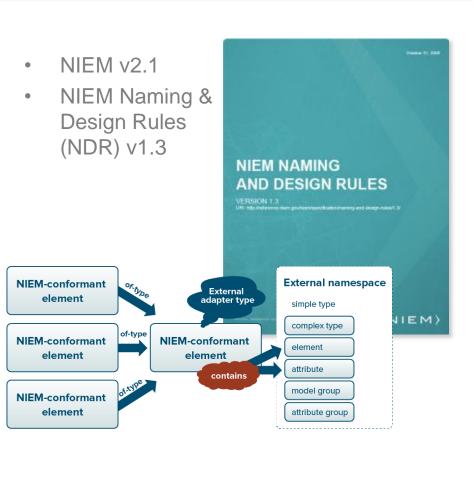
- An international standard provides a common and well known language for expression of geographical features
- Features are more expressive than a coordinate pair by itself
 - Geometry, topology, temporal characteristics
 - Location, shape, extent, color, speed, density, etc.
- Expression of geographic location with an associated reference system
- Widely-used GIS platforms understand GML to display and integrate disparate geographic data sources (e.g., layers, types of data) in a Common Operating Picture

GML IN NIEM:EMBEDDED GML AND NIEM ADAPTERS



- Geography Markup Language (GML) v3.2.1, ISO 19136
- "Embedding GML Best Practice Paper" by Doug Nebert (USGS) (reference for starting position to describe embedded GML)





INFORMATION EXCHANGE REQUIREMENT AND USE CASES



RFI – Request for Information

- RFI is the mechanism through which intelligence analysts and operations managers can request and receive relevant information for processing and analysis connecting the collection step of the Intelligence Cycle with the Situational Awareness step of the Incident Management Cycle.
- Share and track an information request, including the *location* (coordinate and address) of the related incident.

MDA – Maritime Domain Awareness (Vessel Position/Track)

- Maritime Domain Awareness is an inter-agency and international effort to detect and prevent threats at sea or in any navigable waterway.
- Share a number of packages of information that include vessel, cargo, and *location* information (coordinate, address, track, track bounding area) among other items.

TERMINOLOGY FOR ARCHITECTURE AND DEMO



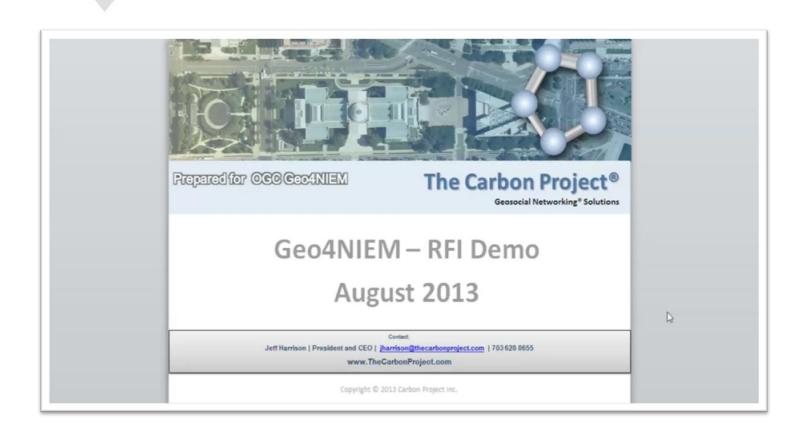
- "RFI IEP" and "Position IEP" refer to documents that conform to a NIEM 2.1 IEPD (RFI 2.1* or Position 3.2).
- "RFI GML" and "VesselTrack GML" refer to documents that conform to a GML application schema.
- The RFI 2.1 IEPD limits the Incident Location Type to an address we modified to allow only embedded GML point and polygon types via the NIEM External Adapter pattern.

REQUEST FOR INFORMATION (RFI) SHARING USE CASE



RFI DEMONSTRATION – CARBON PROJECT





MARITIME DOMAIN AWARENESS (MDA) VESSEL POSITION USE CASE

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MDA VESSEL POSITION DEMONSTRATION – LUCIAD





SUMMARY OF GEOSPATIAL ASSESSMENT AND RECOMMENDATIONS

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GEO4NIEM ENGINEERING REPORT



- "Summary and Recommendations of the Geospatial Enhancement for the National Information Exchange Model (Geo4NIEM) Interoperability Program Pilot" (OGC 13-054r1)
- The Engineering Report can be found at the following URL:
 - http://www.opengeospatial.org/standards/per

SUMMARY OF FINDINGS



Existing NIEM adapter mechanism

 Found to be suitable for embedding GML geometry/feature elements (consistent with GML object-property model).

NIEM NDR 1.3 and GML 3.2.1

 Complying with both specifications was not possible due to conflicting constraints.

NIEM 2.1 geospatial adapter schema

Includes elements that are not geometries. This is not a recommended practice.

Use of NIEM IEPs in OGC Web Services

- WFS was tested by transforming the IEP into a set of GML features conforming to a GML application schema.
- For WFS, the transaction can contain either GML features (transform before WFS) or NIEM IEP (transform at WFS).

SUMMARY OF FINDINGS (CONT)



- NIEM GML NIEM round-trip
 - A full round-trip is possible and partially tested in this initiative.
- NIEM 2.1 nc:LocationType
 - Has many potential elements, some that directly reference earth-referenced geometry and others that do not.
- Geospatial data types
 - Are not defined consistently across NIEM IEPDs.
- NIEM 2.1 nc:GeographicDatumCode
 - Uses an unfamiliar choice of codes.

GEOSPATIAL ENHANCEMENTS AND RECOMMENDATIONS



GML Adapters in NIEM (based on geospatial.xsd)

- Update adapter types based on basic geometry types defined in GML Simple Features (OGC 10-100r3)
- Add a general-purpose Feature Adapter
 - Substitute for gml:AbstractFeature
 - Ex. Allows use of generic Feature in an IEPD, precise type defined in the instance data
- Add a general-purpose Geometry Adapter
 - Substitute for gml:AbstractGeometry
 - Ex. Allows use of generic Geometry in IEPD, precise type defined in the instance data
- Remove curve segment adapters
 - Redundant; they are not geometry types or GML objects themselves, rather constituents of gml:Curve, which already has an associated adapter
- Add Schematron constraints for GMLSF conformance (iaw GMLSF spec above)
- Deprecate the use of specific GML adapters; these should be declared in IEPD schemas using core adapter types.

GEOSPATIAL ENHANCEMENTS AND RECOMMENDATIONS (CONT)



GML Application Schema

- Map and transform NIEM IEPs into GML feature types in order to operationalize NIEM exchanges using OGC web services. (Note: Feature property is like a "NIEM Adapter" in GML app schema.)
- Capture NIEM message-level metadata into a separate metadata entity in the GML application schema instance.

Using and Adapting OGC Web Services

- WFS v2 implementations can accept NIEM message formats and input and output formats (and internally transform to features).
- Consider using Catalog services for storing and retrieving shared information resources, such as MPD artifacts, code lists, service/data descriptions.

GEOSPATIAL ENHANCEMENTS AND RECOMMENDATIONS (CONT)



nc:LocationType Updates

- Add gmlGeometry adapter to supply spatial references using geographic coordinates.
 - Earth-referenced geometry types
 - Geophysical/geopolitical types (e.g., postal address, cross street, gazetteer-type named locations)
- Consider and investigate use of TSPI v2 as a basis for location types throughout NIEM.
- Recommendations to correct issues such as the nc: GeographicDatumCode issue.

GEO4NIEM & NIEM 3.0



- No significant changes recommended to the NIEM technical architecture
- NIEM Technical Architecture Committee (NTAC) reviewed the eight recommendations (specific to GML adapters in NIEM) for inclusion in NIEM 3.0
- Seven recommendations implemented in NIEM 3.0; one recommendation has no impact on the model itself



WHAT'S IN NIEM 3.0?



- Revise adapter cardinality
- Support GML Simple Features (GMLSF) profile
- Define a generic feature adapter
- Define a general-purpose geometry adapter
- Remove adapters for curve segments
- Deprecate specific GML adapter elements
- Add the general-purpose geometry adapter to nc:LocationType
- Add Schematron constraints for GMLSF conformance



Open Geospatial Consortium

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POTENTIAL FUTURE WORK



- Test round-trip to consume and produce NIEM conformant information exchanges with OGC web services
- Information security and tagging
- Test recommendations for changes to nc:LocationType, shore up the types, correcting issues
- Test geocoding processes to produce feature content from NIEM information exchanges containing location types that do not directly reference earth-referenced geometry (addresses, road intersections, place names, etc.)
- Investigate mechanisms to attach/include generic "documents" as part of a NIEM information exchange

THANK YOU! QUESTIONS?

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in November

APPENDIX

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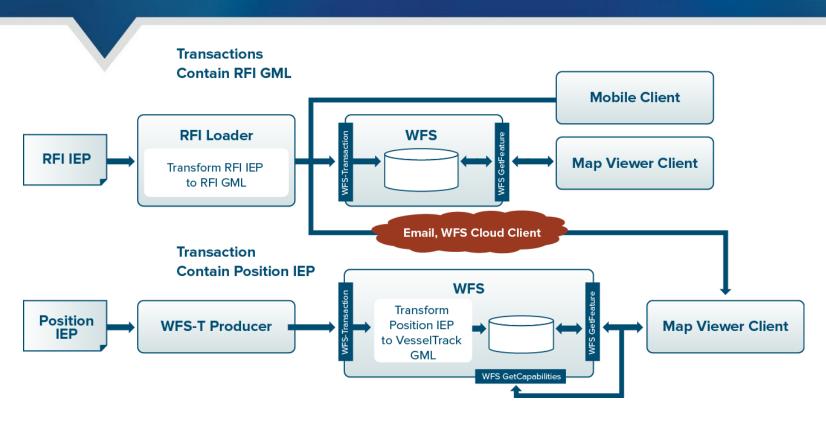
THE OGC INTEROPERABILITY PROGRAM



- A global, collaborative, hands-on engineering, prototyping, and testing designed to rapidly deliver
 - Running code implementations
 - Engineering reports
 - Change requests
 - Demonstration in real world scenarios
- Sponsors and participants work together
 - Sponsors provide requirements, use/business cases and funding
 - Participants work with sponsors to define and/or refine standards to solve a given interoperability problem

DEMONSTRATION ARCHITECTURE





TERMINOLOGY NOTE:

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